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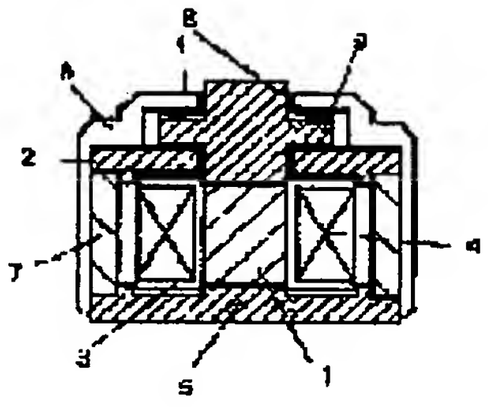
(54) BONE CONDUCTION TYPE VOICE TRANSMISSION DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a wide-range voice which is easy to hear by a small-sized, lightweight transducing element by arranging a driving coil having a magnetostrictive element in its center and providing an annular magnet outside.
SOLUTION: A The driving coil 4 wound around a bobbin 3 so that the magnetostrictive element 1 is in the center is arranged, and the annular magnet 7 is arranged outside it. The annular magnet 7 is clamped by a 1st discoid magnetic body 2 which has a hole bored along the up-down direction and a 2nd discoid magnetic body 5 which is in contact with the magnetostrictive element 1. Further, a magnetic member 9 is inserted into the hole bored in the 1st discoid magnetic body 2 and abuts against the magnetostrictive element 1. Further, those are put in a case 6 across an elastic member 9 to constitute an electro-mechanical transducing element. When the annular magnet applies DC biased magnetization to the magnetostrictive element 1, the magnetostrictive element is driven to generate a voice which has no resonance point and is stable in a low to a high frequency range. Consequently, the electro-mechanical transducing element which is small-sized and lightweight and has high transduction efficiency over a wide range is obtained and an easy-to-hear voice is obtained.



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CLAIMS

[Claim(s)]
[Claim 1] The drive coil by which the coil is carried out the core [rod-like magnetostrictor and this magnetostrictor], In the bone conduction type voice transport unit equipped with this drive coil, the annular magnet arranged around said magnetostrictor, the disc-like magnetic substance of two sheets, the elastic member, the case member, and the magnetic member The upper and lower sides are inserted into said annular magnet with the disc-like magnetic substance of two sheets, and the hole along which the magnetic member which contacts said magnetostrictor passes in the core of the disk of one of these is provided. The bone conduction type voice transport unit characterized by applying the fixed pressure to said magnetostrictor by minding an elastic member between said case members and magnetic members.
[Claim 2] The bone conduction type voice transport unit according to claim 1 characterized by applying the fixed pressure to said magnetostrictor by making the bottom plate which formed the male screw in the female screw section prepared in said case member screw.
[Claim 3] Claim 1 characterized by being the bone conduction type voice transport unit which has Tb0.3Dy0.7Fe2.0 crystal as magnetostrictor, and the fixed pressures applied to said magnetostrictor being 35 thru/or 45kg/cm2, and a bone conduction type voice transport unit given in two.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the electric machine sensing element which changes the electrical signal which changed voice in detail into the machine signal which joins the skull which a hearing impairment person can catch about the voice transport unit used as hearing aid for hearing impairment persons.
[0002]
[Description of the Prior Art] Usually, the eardrum moved by aerial vibration, and human being's voice was transmitted to the brain by having made into the signal the electric pulse generated by oscillation of the eardrum, and recognizes voice. Generally, since said eardrum does not function normally, voice has stopped being able to catch a hearing impairment person easily.
[0003] However, although the eardrum does not function on a hearing impairment person normally, he has much those who can recognize voice by adding a mechanical oscillation to a skull etc. Then, the bone conduction type voice transport unit which makes voice recognize is used as hearing aid by changing into a machine signal the electrical signal which changed voice, and adding an oscillation to a hearing impairment person's skull etc.
[0004] If the approach of changing an electrical signal into a machine signal is divided roughly, it can divide into the resonance mold using resonance, and the dissonance mold which does not use resonance.
[0005] However, although the dissonance mold which does not use resonance has comparatively flat frequency characteristics, electric machine conversion efficiency is seldom [general] used bad.
[0006] Then, the bone conduction type voice transport unit currently conventionally used as hearing aid has a resonance mold in use.
[0007] The electric machine sensing element in the bone conduction type voice transport unit of a resonance mold is the method generally called electrodynamic type, fixed the moving part which vibrates a skull etc. to the coil section which inputs an electrical signal, and has changed the electrical signal into the machine signal by installing a magnet in the core of this coil section.
[0008] Although it can add a forcible oscillation to a skull etc. even if the electric machine sensing element in said resonance type of bone conduction type voice transport unit is a small electrical signal in a certain specific frequency resulting from the mass of moving part etc., i.e., resonance frequency It is very hard to catch the voice in this frequency band, and when the worst, it will become impossible to hear it for a user, since only a feeble oscillation can be added to a skull etc., if it is in the frequency band which separated from resonance frequency.
[0009] Since what is necessary is just to make high kinetic energy which moving part has in order to add a forcible oscillation to a skull etc., if acceleration is increased or mass of moving part etc. is enlarged, kinetic energy will increase and a forcible oscillation can be added to a skull etc.
[0010] However, an electrodynamic type electric machine sensing element has the problem that the standup property of the moving part by inertia will get worse if it is difficult to obtain big acceleration and mass is enlarged, and conversion degradation by the high-pass area part will mainly get worse as a result.
[0011]
[Problem(s) to be Solved by the Invention] In order to solve such a problem, the electric machine sensing element of the structure shown in drawing 5 is proposed.
[0012] 2nd coil section 41b of the same structure as 1st coil section 41a with the coil 45 by which the coil was carried out to the bobbin 46 is connected to a serial, and it has the structure where the electrical signal which changed the sound signal from the signal input terminal 42 can be inputted into said 1st and 2nd coil

sections 41a and 41b.
[0013] Furthermore, the magnet 43 is ****(ed) by the 1st magnetic substance 44 and 2nd magnetic substance 47 which have been arranged so that said 1st and 2nd coil sections 41a and 41b can constitute a parallel magnetic circuit mutually.
[0014] Moreover, 1st coil section 41a and 2nd coil section 41b are connected to 1st movable side 48a and 2nd movable side 48b, respectively, and said movable side is being fixed to the case 50 on the screw 49, respectively.
[0015] Therefore, since one case will be vibrated with the kinetic energy in which the two movable sides have the coil section and a movable piece as a result in order to vibrate a case 50 by dividing into two and an oscillation will be added to a skull etc. by it, even if it is comparatively small mass, it becomes possible to obtain big kinetic energy.
[0016] However, since a configuration is large since the coil actuator is required for two pieces, and weight also becomes heavy and ****** is missing, it is hard to use as an electric machine sensing element used as a bone conduction type voice transport unit.
[0017] Then, this invention aims at offer of the bone conduction type voice transport unit which is a small light weight and used the electric machine sensing element with high rear-spring-supporter conversion efficiency for the broadband.
[0018]
[Means for Solving the Problem] In order to attain the above-mentioned object invention according to claim 1 The drive coil by which the coil is carried out the core [rod-like magnetostrictor and this magnetostrictor], In the bone conduction type voice transport unit equipped with this drive coil, the annular magnet arranged around said magnetostrictor, the disc-like magnetic substance of two sheets, the elastic member, the case member, and the magnetic member The upper and lower sides are inserted into said annular magnet with the disc-like magnetic substance of two sheets, and the hole along which the magnetic member which contacts said magnetostrictor passes in the core of the disk of one of these is provided. The bone conduction type voice transport unit using the electric machine sensing element by which the fixed pressure is applied to said magnetostrictor is offered by minding an elastic member between said case members and magnetic members.
[0019] Here, a flange is prepared in said magnetic member, and if an elastic member is inserted between this flange and a case member, the pressure by the elastic member can be easily applied to said magnetostrictor.
[0020] Furthermore, invention according to claim 2 offers the bone conduction type voice transport unit according to claim 1 by which the fixed pressure is applied to said magnetostrictor by making the bottom plate which formed the male screw in the female screw section prepared in said case member screw.
[0021] Moreover, invention according to claim 3 is a bone conduction type voice transport unit which has Tb0.3Dy0.7Fe2.0 crystal as magnetostrictor, and offers claim 1 whose fixed pressures applied to said magnetostrictor are 35 thru/or 45kg/cm2, and a bone conduction type voice transport unit given in two.
[0022]
[Embodiment of the Invention] The method of using magnetostrictor for one of the approaches which changes an electrical signal into a machine signal is raised.
[0023] If an external magnetic field is made to act on the magnetic substance, elongation or a contraction will occur in the magnetic substance. This is called magnetostriction. Magnetostriction is conventionally applied to the object for variation control or the actuator for actuation, various sensors, etc. Although the amount of magnetostriction of magnetostriction is very small, it has been the description that it is dramatically strong, the driving force generated by magnetostriction, i.e., kinetic energy.
[0024] Practicability is highly used abundantly for the magnetostrictor in which it has Tb0.3Dy0.7Fe2.0 crystal as magnetostrictor which raised the amount of magnetostriction in low magnetic field strength although it is required fundamentally that the amount of magnetostriction of magnetostrictor should be large.
[0025] Although it is known that change will appear in the amount of magnetostriction if ****** is generally added, magnetostrictor applies a fixed pressure to which the amount of magnetostriction becomes the largest at this magnetostrictor, installs a drive coil in that perimeter, and impresses a direct-current field with a permanent magnet etc. Then, the electrical signal which changed voice into the drive coil is added, and this magnetostrictor is driven.
[0026] Since driving force is very strong though the amount of magnetostriction of magnetostrictor is small as mentioned above, a forcible oscillation can be given to a skull etc.
[0027]

[Example] Next, it explains to a detail further using a drawing.
[0028] The sectional view of the electric machine sensing element in the bone conduction type voice transport unit using the magnetostrictor which starts this invention at drawing 1 (a) is shown.
[0029] The drive coil 4 by which the coil was carried out to the bobbin 3 the core [magnetostrictor 1] is arranged, and an admiration-like magnet is further arranged on the outside. This annular magnet is ****(ed) by the 1st disc-like magnetic substance 2 which is in contact also with the 1st disc-like magnetic substance 2 and said magnetostrictor 1 which prepared the hole focusing on the upper and lower sides.
[0030] Moreover, the magnetic member 9 was inserted through the hole established in the 1st disc-like magnetic substance 2, and it is in contact with said magnetostrictor. Furthermore, these whole is put into a case 6 and an electric machine sensing element is constituted.
[0031] Here, between a case 6 and the magnetic member 9, the elastic member 8 is inserted so that suitable ****** for said magnetostrictor 1 may be added.
[0032] DC magnetic deviation is added to magnetostrictor 1 by the magnetic circuit constituted by the annular magnet 7, the 1st disc-like magnetic substance 2, the 1st disc-like magnetic substance 2, and the magnetic member 9.
[0033] Thus, the amount of magnetostriction of magnetostrictor 1 and the relation of magnetism which were constituted serve as a hysteresis curve as shown in drawing 2 .
[0034] Since DC magnetic deviation is added to magnetostrictor 1 with the annular magnet as mentioned above, the operating point will move to a B point and magnetostrictor 1 can be driven in that magnetostriction operates to linearity.
[0035] The frequency characteristics of the earphone mold bone conduction type voice transport unit (conventional example 2) using the conventional electrodynamic type electric machine sensing element mentioned above and the bone conduction type voice transport unit (conventional example 1) using an electrodynamic type electric machine sensing element with the coil actuator required for two pieces which is this advanced type, and the bone conduction type voice transport unit using the electric machine sensing element concerning this invention are shown in drawing 3 .
[0036] In addition, measurement of the acceleration shown in this Fig. measured the amount of the maximum conversion of magnetostrictor by laser light, and since it was changing in proportion to the signal concerning a drive coil, this amount of conversion was computed by differentiating the second degree of the amount of conversion.
[0037] From this Fig., although the bone conduction type voice transport unit using the conventional electrodynamic type electric machine sensing element vibrates forcibly in the resonance point, if it separates from it from the resonance point, it will serve as a feeble oscillation, and the voice of this frequency band is understood that it is dramatically difficult to hear it.
[0038] On the other hand, since the bone conduction type voice transport unit using the electric machine sensing element concerning this invention does not have the resonance point, but is stabilized from a low frequency field in addition and can obtain big acceleration, it can hear the voice stabilized ranging from the low frequency field to a RF field.
[0039] Drawing 1 (b) is the sectional view showing other examples of the electric machine sensing element in the bone conduction type voice transport unit using the magnetostrictor concerning this invention.
[0040] Although it is equivalent to the example of drawing 1 (a) to drive magnetostrictor with the electrical signal which arranges a drive coil 4 and the annular magnet 7 focusing on magnetostrictor, adds DC magnetic deviation to said magnetostrictor by the two disc-like magnetic substance and magnetic members 10, and joins a drive coil, the bottom plate 13 which prepared the female screw section in the case 12 which inserts these whole, and prepared the male screw section is made to screw. The suitable load for magnetostrictor can be added by rotating the tongue 13 for adjustment provided in a bottom plate 13.
[0041] ****** at the time of using the magnetostrictor which has Tb0.3Dy0.7Fe2.0 crystal in drawing 4 , and the correlation diagram of magnetostriction are shown.
[0042] When 35 thru/or 45kg/cm2 are added to said magnetostrictor as ******, it turns out that the biggest magnetostriction is shown, and this Fig. shows that it is the optimal as ****** of the magnetostrictor used for the electric machine sensing element of a bone conduction type voice transport unit.
[0043] Here, although the magnetostrictor which has Tb0.3Dy0.7Fe2.0 crystal as magnetostrictor was used in this example, other magnetostrictors may be used if a forcible oscillation can be added by the drive coil.
[0044]
[Effect of the Invention] Since this invention enables it to be a small light weight and to provide a broadband with an electric machine sensing element with high rear-spring-supporter conversion efficiency,

the bone conduction type voice transport unit which can recognize the voice which is very easy to hear it can be offered.

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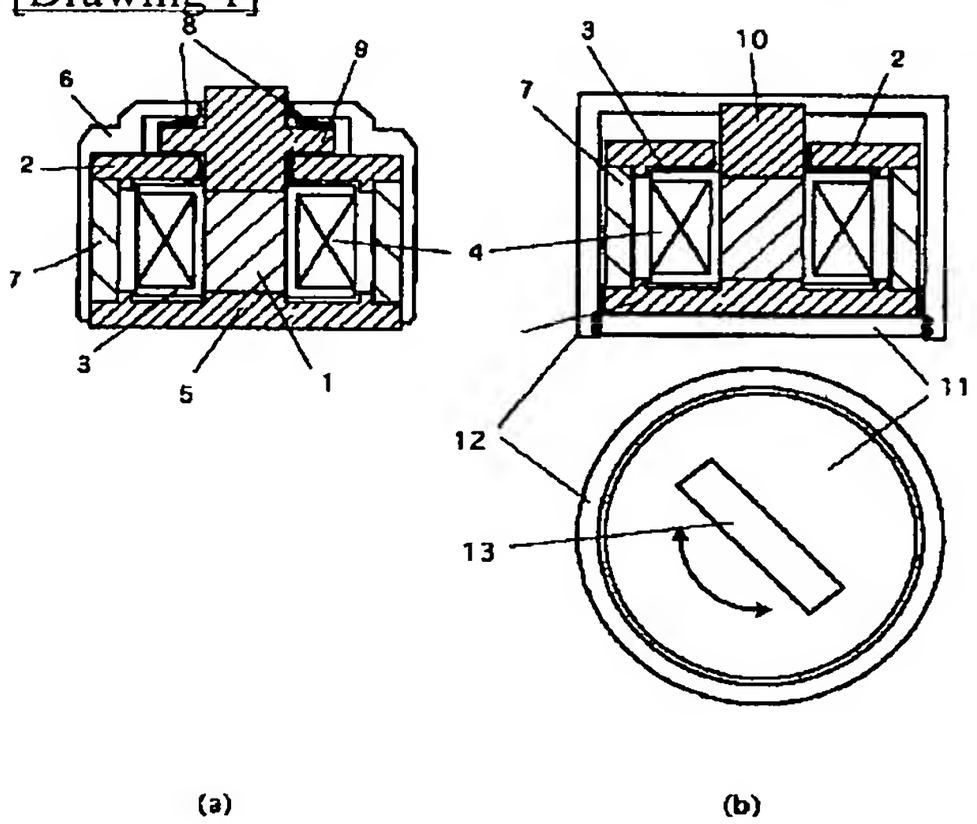
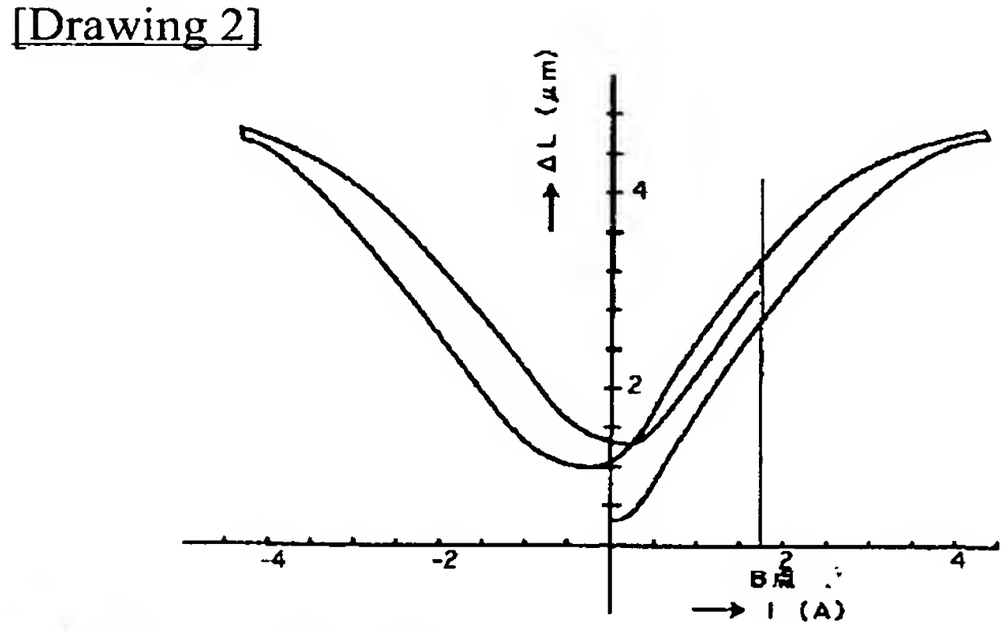
DRAWINGS

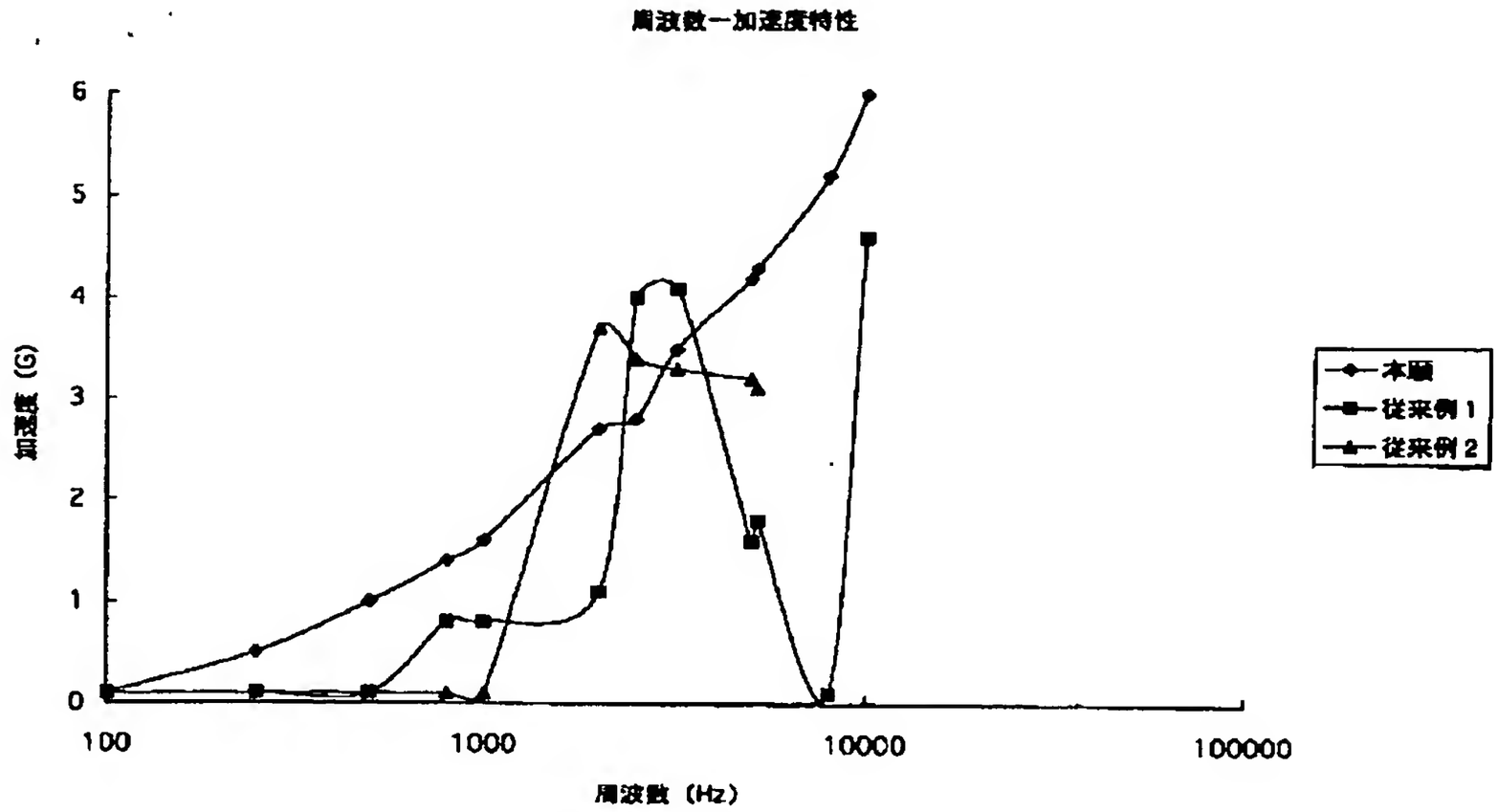
[Drawing 1]



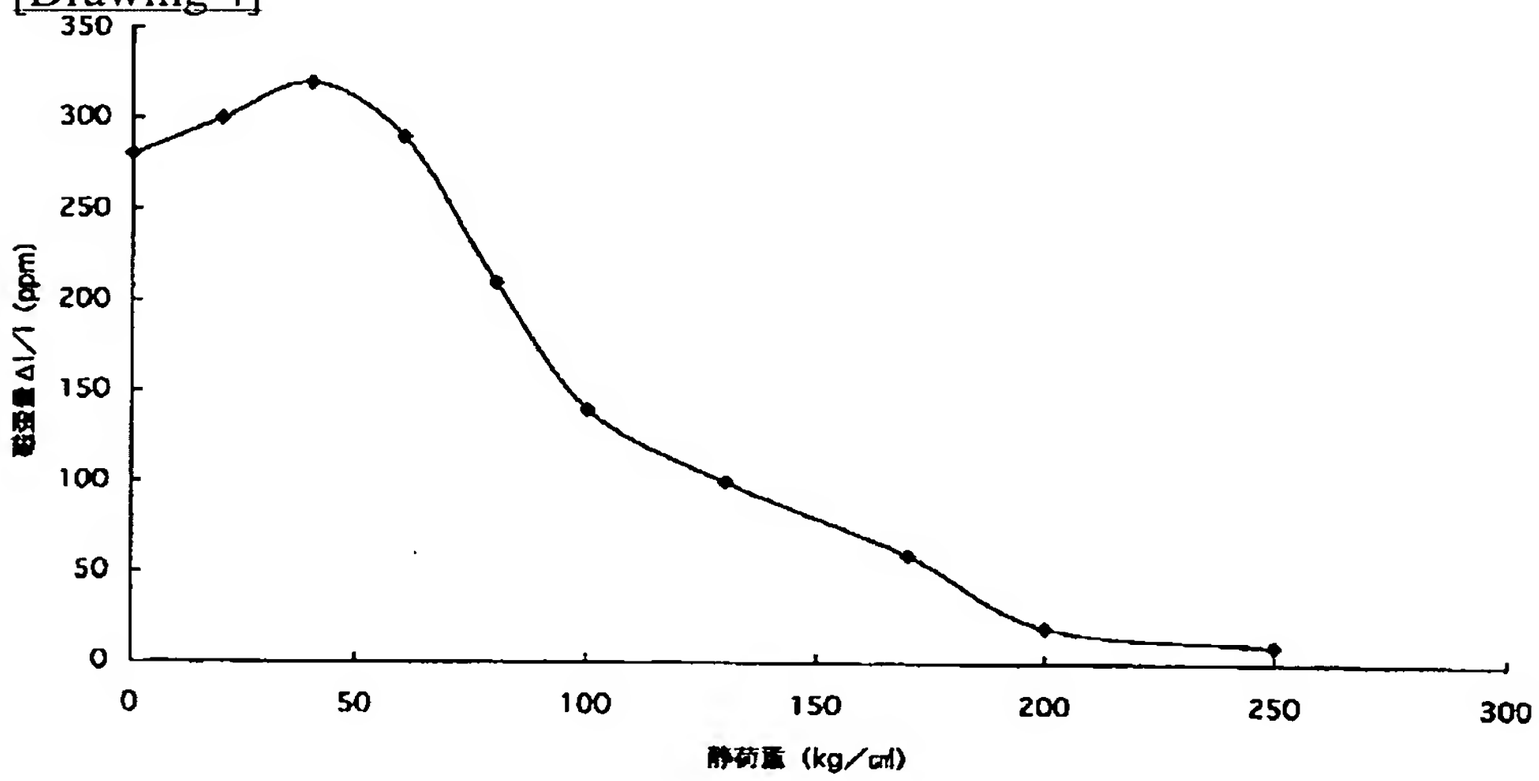
[Drawing 2]



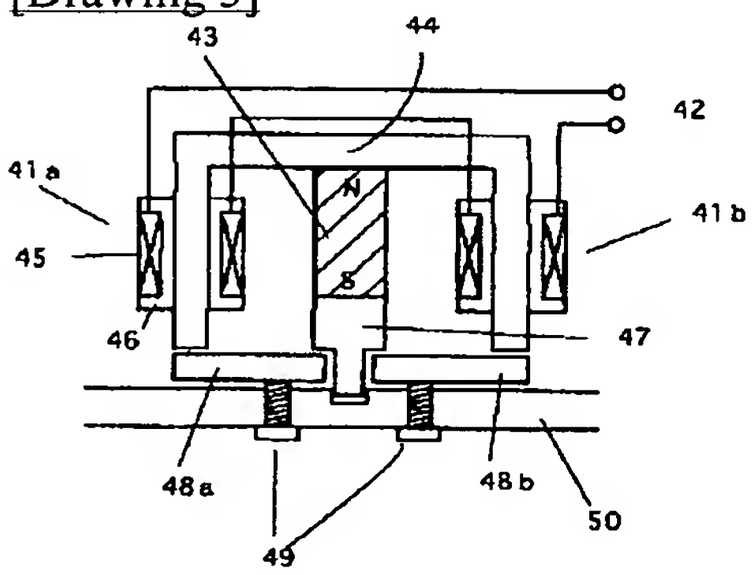
[Drawing 3]



[Drawing 4]



[Drawing 5]



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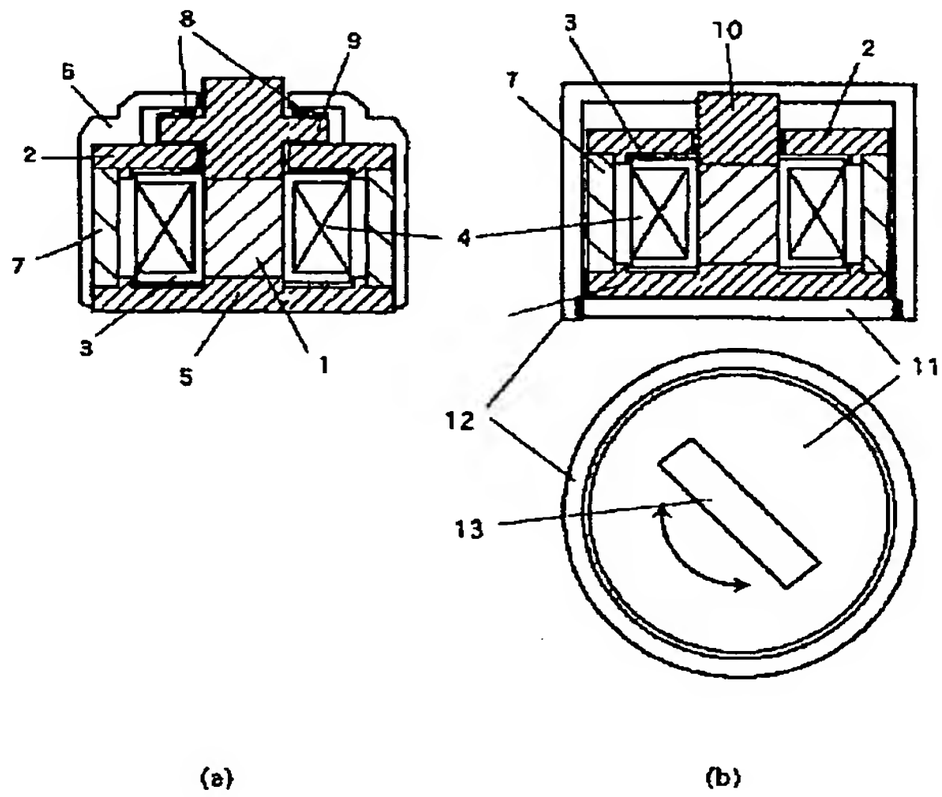
(54)【発明の名称】　骨導式音声伝達装置

(57)【要約】
【課題】本発明は小型軽量であって広帯域にわたり変換効率の高い電気機械変換素子を用いた骨導式音声伝達装置の提供を目的とする。
【解決手段】磁歪素子は一般に静加重を加えると磁歪量に変化が現れることが知られているが、この磁歪素子に磁歪量が最も大きくなるような一定の圧力を加え、その周囲に駆動コイルを設置し、永久磁石等によって直流磁界を印加する。その後、駆動コイルへ音声を変換した電気信号を加え、該磁歪素子を駆動する。磁歪素子の磁歪量は小さいながらも駆動力が非常に強い特徴があるため、磁歪素子を用いた骨導式音声伝達装置は、広帯域にわたり音声を認識することができる。



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【特許請求の範囲】
【請求項１】棒状の磁歪素子と、該磁歪素子を中心として巻線されている駆動コイルと、該駆動コイルと前記磁歪素子の周囲に配置された環状磁石と、２枚の円板状磁性体と弾性部材とケース部材と磁性部材とを備えた骨導式音声伝達装置において、前記環状磁石は上下を２枚の円板状磁性体で挟まれていて、その一方の円板の中心部には前記磁歪素子に当接する磁性部材が通る穴を具備し、前記ケース部材と磁性部材との間に弾性部材を介することによって前記磁歪素子に一定の圧力が加えられていることを特徴とする骨導式音声伝達装置。
【請求項２】前記ケース部材に設けられた雌ねじ部に雄ねじを設けた底板を螺合させることにより前記磁歪素子に一定の圧力が加えられていることを特徴とする請求項１記載の骨導式音声伝達装置。
【請求項３】磁歪素子として$Tb_{0.3}Dy_{0.7}Fe_{2.0}$結晶をもつ骨導式音声伝達装置であって、前記磁歪素子に加えられる一定の圧力が３５乃至４５ｋｇ／ｃｍ²であることを特徴とする請求項１及び２記載の骨導式音声伝達装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、難聴者用の補聴器として用いられる音声伝達装置に関するものであり、詳しくは音声を変換した電気信号を難聴者が聞き取り可能な頭蓋骨等に加わる機械信号に変換する電気機械変換素子に関するものである。
【０００２】
【従来の技術】通常、人間の音声は空気振動によって鼓膜が動き、鼓膜の振動によって発生する電気パルスを信号として脳に伝達し音声を認識している。一般に難聴者は、前記鼓膜が正常に機能しないため、音声が聞き取りにくくなっている。
【０００３】しかし、難聴者には、鼓膜は正常に機能しないが、頭蓋骨等に機械的な振動を加えることによって音声を認識できる者が多い。そこで、音声を変換した電気信号を機械信号に変換し難聴者の頭蓋骨等に振動を加えることによって音声を認識させる骨導式音声伝達装置が補聴器として使われている。
【０００４】電気信号を機械信号に変換する方法を大別すると共振を利用する共振型と共振を利用しない非共振型に分けることができる。
【０００５】しかし、共振を利用しない非共振型は比較的平坦な周波数特性を持っているが、電気機械変換効率が悪く一般にはあまり使われていない。
【０００６】そこで、従来補聴器として使われている骨導式音声伝達装置は共振型が主流となっている。
【０００７】共振型の骨導式音声伝達装置における電気機械変換素子は、一般に動電型といわれている方式で、電気信号を入力するコイル部に頭蓋骨等を振動させる可動部を固定し、該コイル部の中心に磁石を設置することにより電気信号を機械信号に変換している。

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【０００８】前記共振型の骨導式音声伝達装置における電気機械変換素子は、可動部等の質量に起因するある特定の周波数、即ち共振周波数において小さな電気信号であっても頭蓋骨等に力強い振動を加えることができるが、共振周波数から外れた周波数帯にあっては、頭蓋骨等に微弱な振動しか加えることができないため、使用者にとってこの周波数帯域にある音声は非常に聞き取りにくく、最悪の場合は聞くことができなくなってしまう。
【０００９】頭蓋骨等に力強い振動を加えるためには可動部の持つ運動エネルギーを高くすればよいので、加速度を増加するか、可動部等の質量を大きくすれば運動エネルギーが増し頭蓋骨等に力強い振動を加えることができることとなる。
【００１０】しかし、動電型の電気機械変換素子は大きな加速度を得ることは困難であり、質量を大きくすると慣性による可動部の立ち上がり特性が悪化し、その結果主として高域部での変換劣化が悪化してしまうという問題がある。
【００１１】
【発明が解決しようとする課題】このような問題を解決するため図５に示す構造の電気機械変換素子が提案されている。
【００１２】ボビン４６に巻線されたコイル４５をもつ第１のコイル部４１ａと同様な構造の第２のコイル部４１ｂを直列に接続し、信号入力端子４２より音声信号を変換した電気信号を前記第１および第２のコイル部４１ａ，４１ｂへ入力できる構造となっている。
【００１３】さらに、磁石４３は前記第１および第２のコイル部４１ａ，４１ｂが互いに並列な磁気回路を構成できるよう配置された第１の磁性体４４と第２の磁性体４７により狭持されている。
【００１４】また、第１のコイル部４１ａと第２のコイル部４１ｂはそれぞれ第１の可動辺４８ａおよび第２の可動辺４８ｂに接続され前記可動辺はそれぞれケース５０にビス４９によって固定されている。
【００１５】したがって、コイル部および可動片を２つに分けケース５０を振動させるため結果的に２つの可動辺のもつ運動エネルギーにより１つのケースを振動させ、それによって頭蓋骨等に振動を加えることとなるので、比較的小さな質量であっても大きな運動エネルギーを得ることが可能となる。
【００１６】しかし、コイル駆動部が２個必要であるため形状が大きく、また重量も重くなり軽敏さに欠けるため、骨導式音声伝達装置として用いられる電気機械変換素子としては使いづらいものとなる。
【００１７】そこで、本発明は小型軽量であって広帯域にわたり変換効率の高い電気機械変換素子を用いた骨導式音声伝達装置の提供を目的とする。

【００１８】
【課題を解決するための手段】上記目的を達成するため請求項１記載の発明は、棒状の磁歪素子と、該磁歪素子を中心として巻線されている駆動コイルと、該駆動コイルと前記磁歪素子の周囲に配置された環状磁石と、２枚の円板状磁性体と弾性部材とケース部材と磁性部材とを備えた骨導式音声伝達装置において、前記環状磁石は上下を２枚の円板状磁性体で挟まれていて、その一方の円板の中心部には前記磁歪素子に当接する磁性部材が通る穴を具備し、前記ケース部材と磁性部材との間に弾性部材を介すことによって前記磁歪素子に一定の圧力が加えられている電気機械変換素子を用いた骨導式音声伝達装置を提供する。
【００１９】ここで、前記磁性部材にフランジを設け、該フランジ部とケース部材の間に弾性部材を挿入すれば前記磁歪素子に対し、容易に弾性部材による圧力を加えることができる。
【００２０】さらに、請求項２に記載の発明は、前記ケース部材に設けられた雌ねじ部に雄ねじを設けた底板を螺合させることにより前記磁歪素子に一定の圧力が加えられている請求項１記載の骨導式音声伝達装置を提供する。
【００２１】また、請求項３に記載の発明は、磁歪素子として$Tb_{0.3}Dy_{0.7}Fe_{2.0}$結晶をもつ骨導式音声伝達装置であって、前記磁歪素子に加えられる一定の圧力が３５乃至４５ｋｇ／ｃｍ^{2}である請求項１及び２記載の骨導式音声伝達装置を提供する。
【００２２】
【発明の実施の形態】電気信号を機械信号に変換する方法の一つに磁歪素子を用いる方法があげられる。
【００２３】磁性体に外部磁界を作用させると磁性体には伸びあるいは縮みが発生する。これを磁歪と称する。磁歪は、従来より変異制御用あるいは駆動用アクチュエータ、各種センサ等に応用されている。磁歪は磁歪量が非常に小さいものであるが、磁歪により発生する駆動力、即ち運動エネルギーは非常に強いことが特徴となっている。
【００２４】磁歪素子は磁歪量が大きいことが基本的に要求されるが、低磁界強度での磁歪量を向上させた磁歪素子として$Tb_{0.3}Dy_{0.7}Fe_{2.0}$結晶をもつ磁歪素子が実用性が高く多用されている。
【００２５】磁歪素子は一般に静加重を加えると磁歪量に変化が現れることが知られているが、この磁歪素子に磁歪量が最も大きくなるような一定の圧力を加え、その周囲に駆動コイルを設置し、永久磁石等によって直流磁界を印加する。その後、駆動コイルへ音声を変換した電気信号を加え、該磁歪素子を駆動する。
【００２６】前述したように、磁歪素子の磁歪量は小さいながら駆動力は非常に強いものであるので、頭蓋骨等に力強い振動を与えることができる。

【００２７】
【実施例】次に、図面を用いさらに詳細に説明する。
【００２８】図１（ａ）に本発明にかかる磁歪素子を用いた骨導式音声伝達装置における電気機械変換素子の断面図を示す。
【００２９】磁歪素子１を中心としてボビン３に巻線された駆動コイル４を配置し、さらにその外側に感状磁石を配置する。該環状磁石はその上下を中心に穴を設けた第１の円板状磁性体２と前記磁歪素子１にも接している第１の円板状磁性体２に狭持される。
【００３０】また、第１の円板状磁性体２に設けられた穴を通して磁性部材９が差し込まれ、前記磁歪素子に当接している。さらに、これら全体をケース６に入れ電気機械変換素子を構成する。
【００３１】ここで、ケース６と磁性部材９との間には、前記磁歪素子１に適切な静加重が加わるよう弾性部材８を挿入している。
【００３２】磁歪素子１には、環状磁石７と第１の円板状磁性体２と第１の円板状磁性体２、および磁性部材９によって構成される磁気回路により直流偏磁が加えられる。
【００３３】このように構成された磁歪素子１の磁歪量と磁力の関係は、図２に示すようなヒステリシスカーブとなる。
【００３４】前述したように、磁歪素子１には環状磁石により直流偏磁が加えられているため、動作点が例えばＢ点に移動し、磁歪が線形に動作する点で磁歪素子１を駆動することができることとなる。
【００３５】前述した、従来の動電型電気機械変換素子を用いたイヤホーン型骨導式音声伝達装置（従来例２）および、この改良型であるコイル駆動部が２個必要な動電型電気機械変換素子を用いた骨導式音声伝達装置（従来例１）と、本発明にかかる電気機械変換素子を用いた骨導式音声伝達装置の周波数特性を図３に示す。
【００３６】なお、本図において示されている加速度の測定は、レーザー光によって磁歪素子の最大変移量を測定し、該変移量は駆動コイルにかかる信号に比例して変移していることから、変移量を２階微分することにより算出した。
【００３７】本図より、従来の動電型電気機械変換素子を用いた骨導式音声伝達装置は共振点においては力強く振動するが共振点から外れると微弱な振動となり、この周波数帯域の音声は聞くことが非常に困難であることがわかる。
【００３８】これに対して、本発明にかかる電気機械変換素子を用いた骨導式音声伝達装置は共振点を持たず、加えて低周波領域から安定して大きな加速度を得ることができるため、低周波領域から高周波領域にわたって安定した音声を聞くことができる。
【００３９】図１（ｂ）は本発明にかかる磁歪素子を用

いた骨導式音声伝達装置における電気機械変換素子の、他の実施例を示す断面図である。

【００４０】磁歪素子を中心として駆動コイル４や環状磁石７を配置し、二つの円板状磁性体と磁性部材１０で前記磁歪素子に直流偏磁を加え、駆動コイルに加わる電気信号で磁歪素子を駆動することは図１（ａ）の実施例と同等であるが、それら全体を挿入するケース１２に雌ねじ部を設け、雄ねじ部を設けた底板１３を螺合させている。底板１３に具備される調整用つまみ１３を回転させることにより磁歪素子に適切な加重を加えることができる。

【００４１】図４に、$Tb_{0.3}Dy_{0.7}Fe_{2.0}$ 結晶をもつ磁歪素子を用いた場合の静加重と磁歪の相関図を示す。

【００４２】本図より、前記磁歪素子に静加重として３５乃至４５ｋｇ／ｃｍ²を加えたとき最も大きな磁歪を示すことがわかり、骨導式音声伝達装置の電気機械変換素子に用いられる磁歪素子の静加重としては最適であることがわかる。

【００４３】ここで、本実施例では磁歪素子として$Tb_{0.3}Dy_{0.7}Fe_{2.0}$ 結晶をもつ磁歪素子を用いたが、駆動コイルにより力強い振動を加えることができるならば他の磁歪素子を用いても良い。

【００４４】

【発明の効果】本発明により、小型軽量であって広帯域にわたり変換効率の高い電気機械変換素子を提供することが可能となるので、非常に聞き易い音声を認識できる

骨導式音声伝達装置を提供することができる。

【図面の簡単な説明】

【図１】本発明にかかる磁歪素子を用いた骨導式音声伝達装置における電気機械変換素子の断面図

【図２】磁歪素子の磁歪量と磁力の関係図

【図３】磁歪素子の周波数特性

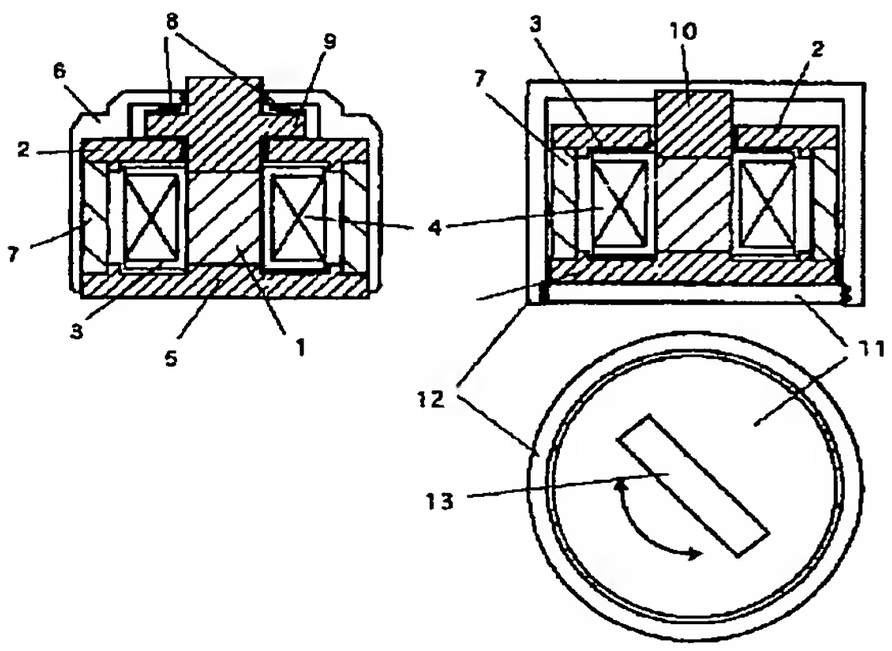
【図４】$Tb_{0.3}Dy_{0.7}Fe_{2.0}$ 結晶の磁歪素子を用いた静加重と磁歪量の相関図

【図５】従来の電気機械変換素子の概念図

【符号の説明】

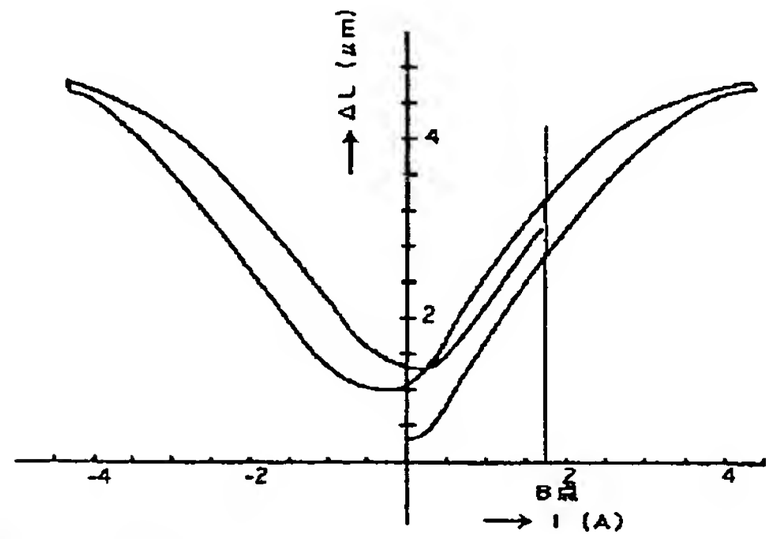
１　磁歪素子
２　第１の円板状磁性体
４　駆動コイル
５　第２の円板状磁性体
６　ケース
７　環状磁石
８　弾性部材
９　磁性部材
１１　雄ねじ部を設けた底板
１２　雌ねじ部を設けたケース
４１　第１、第２のコイル部
４３　磁石
４４　第１の磁性体
４７　第２の磁性体
４８　第１、第２の可動片
５０　ケース

【図１】



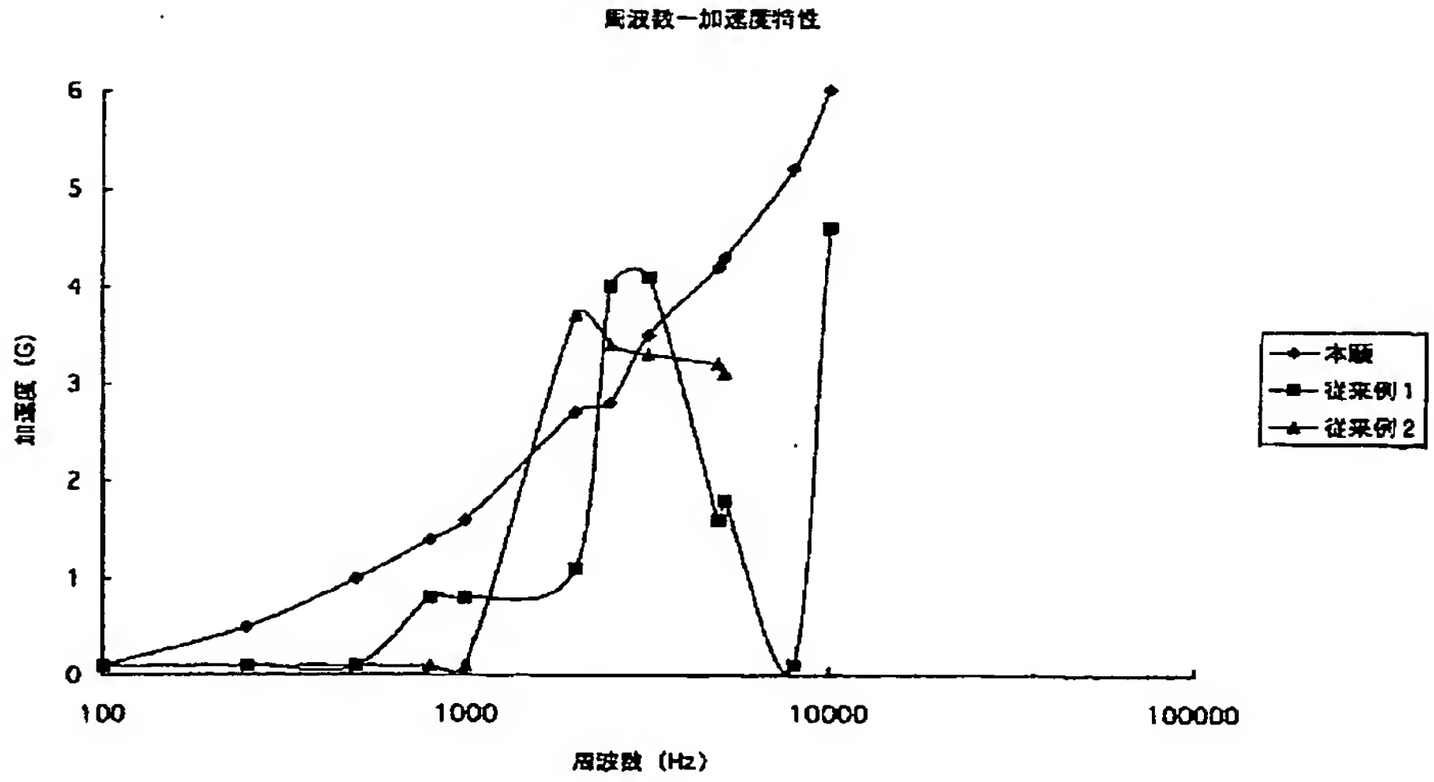
(a)　　(b)

【図２】

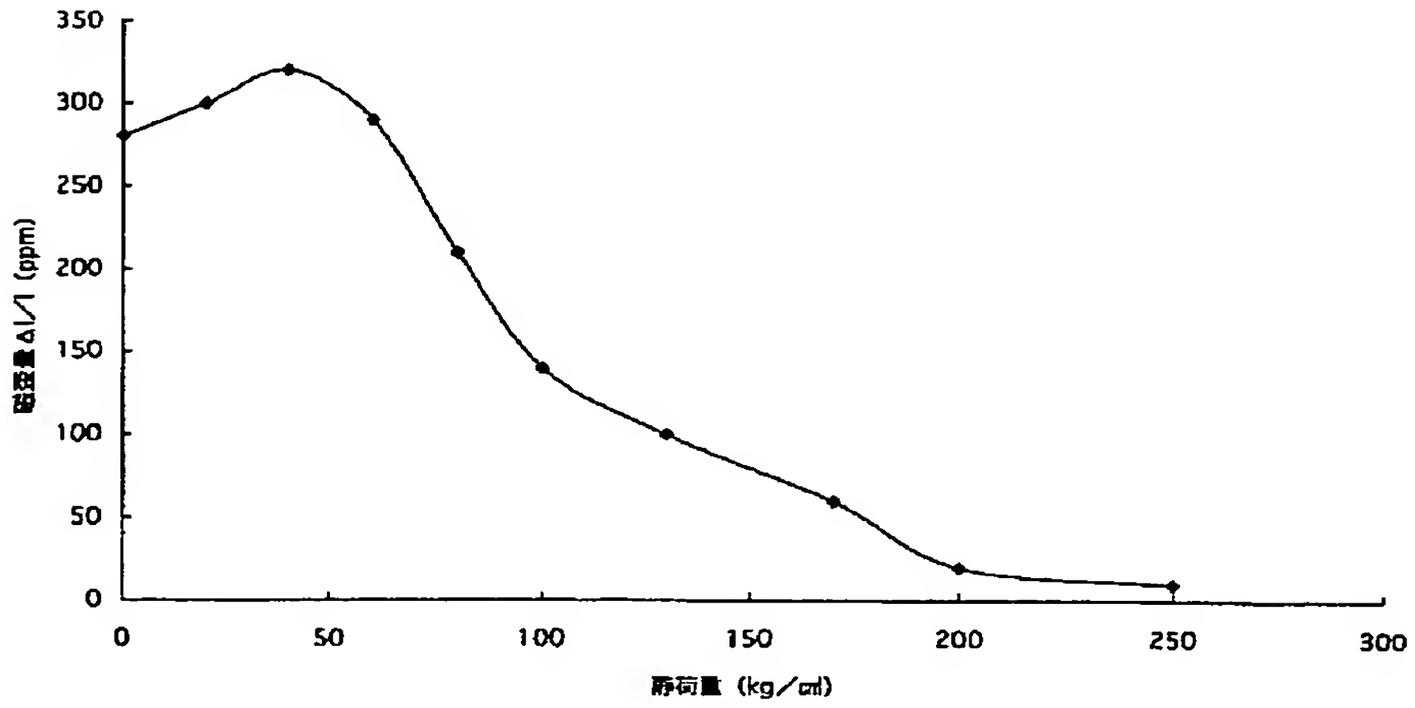


試料形状　　φ２×４（mm）
プレストレス　　５０ｋｇｆ／ｃｍ²
換算値　　1.0kOe=4.0A

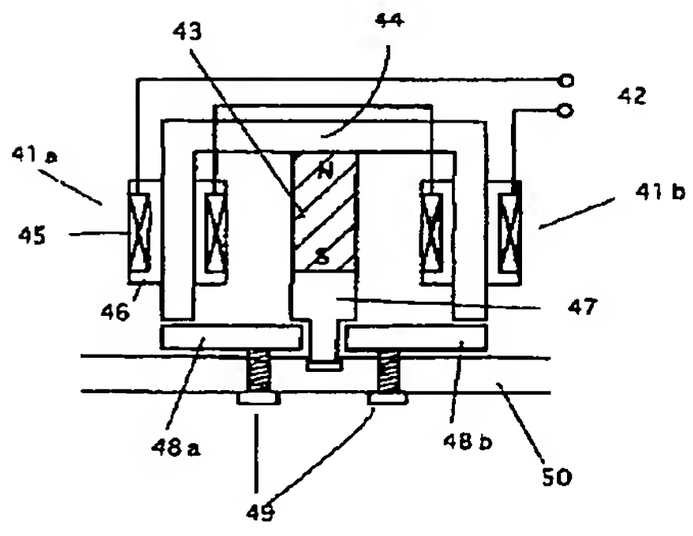
【図３】


周波数ー加速度特性
加速度（G）
0
1
2
3
4
5
6
100
1000
10000
100000
周波数（Hz）
本願
従来例１
従来例２

【図４】


磁歪量ΔL/l（ppm）
0
50
100
150
200
250
300
350
0
50
100
150
200
250
300
荷重（kg／cm）

【図５】


43
44
42
41a
41b
45
N
S
46
47
48a
48b
49
50